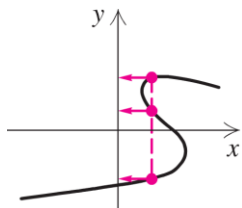


The Graph of a Function

Not every collection of points in the xy -plane represents a function. Remember, for a function, each number x in the domain has exactly one image y in the range. The graph of the function must satisfy the *vertical line test*.

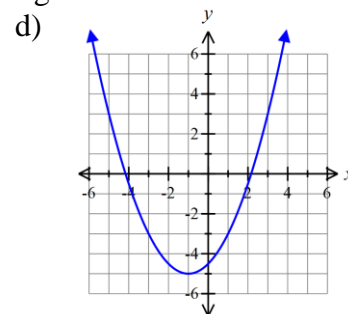
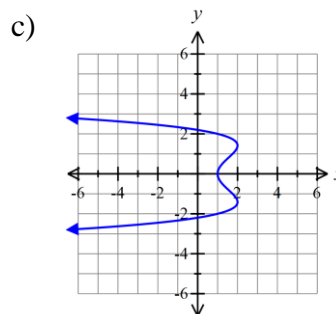
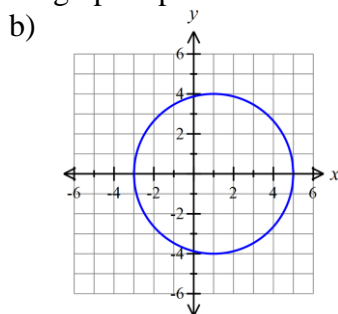
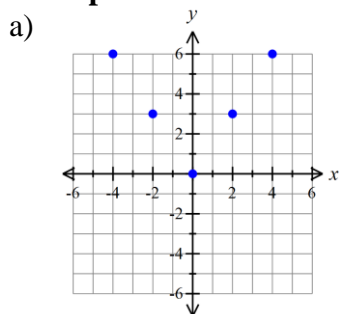
Vertical Line Test



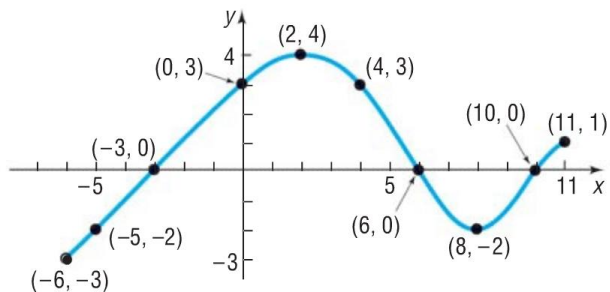
If it is possible for a vertical line to cross a graph more than once, then the graph is not the graph of a function.

The graph at left is not a function because three y -values correspond to one x -value.

Examples: Decide whether each graph represents a function. Then find the domain and range.



Example (#9 on homework):



a) Find $f(0)$ and $f(-6)$.

b) Find $f(6)$ and $f(11)$.

c) Is $f(3)$ positive or negative?

d) Is $f(-4)$ positive or negative?

e) For what values of x is $f(x) = 0$?

f) For what values of x is $f(x) > 0$?

g) What is the domain of f ?

h) What is the range of f ?

i) What are the x -intercepts?

j) What is the y -intercept?

k) How often does the line $y = 1/2$ intersect the graph?

l) How often does the line $x = 5$ intersect the graph?

m) For what values of x does $f(x) = 3$?

n) For what values of x does $f(x) = -2$?

Example: $f(x) = \frac{x^2 + 2}{x + 4}$

- a) Is the point $(1, 3/5)$ on the graph of f ?
- b) If $x = 0$, what is $f(x)$? What point is on the graph of f ?
- c) If $f(x) = 1/2$, what is x ? What point(s) are on the graph of f ?
- d) What is the domain of f ?
- e) List the x -intercepts, if any, of the graph of f .
- f) List the y -intercept, if there is one, of the graph of f .

Example: A golf ball is hit with an initial velocity of 130 feet per second at an inclination of 45° to the horizontal. In physics, it is established that the height h of the golf ball is given by the function

$h(x) = \frac{-32x^2}{130^2} + x$ where x is the horizontal distance that the golf ball has traveled.

- a) Determine the height of the golf ball after it has traveled 100 feet, 300 feet, and 500 feet.
- b) How far was the golf ball hit?
- c) Using a graphing calculator, graph the function $h = h(x)$.
- d) How far has the ball traveled when it reaches its maximum height? What is its maximum height?